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# IMPLEMENTATION PLAN REVIEW FOR KENTUCKY AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

Environmental Protection Agency

Prepared for:

Argonne National Laboratory

December 1974

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# IMPLEMENTATION PLAN REVIEW FOR KENTUCKY AS REQUIRED BY THE ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

U. S. ENVIRONMENTAL PROTECTION AGENCY

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EPA-450/3-74-077

# KENTUCKY

# ENERGY SUPPLY AND ENVIRONMENTAL COORDINATION ACT

# SECTION IV - STATE IMPLEMENTATION PLAN REVIEW

PREPARED BY THE FOLLOWING TASK FORCE:

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U.S. Environmental Protection Agency
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Section IV of the Energy Supply and Environmental Coordination Act of 1974, (ESECA) requires EPA to review each State Implementation Plan (SIP) to determine if revisions can be made to control regulations for stationary fuel combustion sources without interferring with the attainment and maintenance of the national ambient air quality standards. This document, which is also required by Section IV of ESECA, is EPA's report to the State indicating where regulations might be revised.

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IMPLEMENTATION PLAN REVIEW

FOR

KENTUCKY

Required by the Energy Supply and Environmental Coordination Act

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# STATE IMPLEMENTATION PLAN REVIEW
# FOR
# THE STATE OF KENTUCKY

## 1.0 Executive Summary

The enclosed report is the U.S. Environmental Protection Agency's (EPA) response to Section IV of the Energy Supply and Environmental Coordination Act of 1974 (ESECA). Section IV requires EPA to review each State Implementation Plan (SIP) to determine if control regulations for stationary fuel combustion can be revised without interfering with the attainment and maintenance of the National Ambient Air Quality Standards (NAAQS). In addition to requiring that EPA advise the State as to whether control regulations can be revised, ESECA provides that EPA must approve or disapprove any revised regulations relating to fuel burning stationary sources within three months after they are submitted to EPA by the States. The States may, as under the Clean Air Act of 1970, initiate State implementation plan revisions; ESECA does not, however, require States to change any existing plan.

Congress has intended that this report provide the State with information on excessively restrictive control regulations. The intent of ESECA is that SIPs, wherever possible, be revised in the interest of conserving low-sulfur fuels or converting to coal sources which burn oil or natural gas. EPA's objective in carrying out the SIP reviews, therefore, has been to try to determine if emissions from certain combustion sources may be increased without interference with the attainment and maintenance of standards. If so, it may be possible through altered resource allocations to effect significant "clean fuel savings" in a manner consistent with both environmental and national energy needs.

In many respects, the ESECA SIP reviews parallel the implementation of EPA's policy on clean fuels. Under the Clean Fuels Policy, implementation plans have been reviewed with a view to saving low sulfur fuels. Where the primary sulfur dioxide air quality standards will not be exceeded, States have been encouraged to either defer attainment of secondary standards or to revise the $SO_2$ emission regulations. The States have also been asked to discourage large-scale shifts from coal to oil where this could be done without jeopardizing the attainment and maintenance of the NAAQS.



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To date, this activity has involved only those States with the largest clean fuels saving potential. Several of these States have revised or are currently in the process of revising their $SO_2$ regulations. These States are generally in the eastern half of the United States. ESECA, however, requires the analysis of potentially over-restrictive regulations in all 55 States and territories. In addition, the current reviews address the attainment and maintenance of all the National Ambient Air Quality Standards.

The adoption of emission limitations which may in some areas of States be overly restrictive (or not restrictive enough) resulted largely from the use of the "example region" approach along with analyses which considered the "hot spots" of an Air Quality Control Region (AQCR) rather than the entire region. This type of approach was offered in EPA guidelines for plan development when States were preparing their original plans. Many States, such as Kentucky, through concurrence with EPA, adopted the example region approach, largely because of the short timetable dictated by the Clean Air Act. Also, in most cases, the original SIPs were designed to attain and maintain the original NAAQS, some of which have since been designated as "guides" only or actually rescinded. However, many States have adopted and retained the original Federal standards or, in a few cases have adopted more restrictive State standards, and these served as the basis on which their SIPs were approved. As a result, the requirements of many State plans conflict with legitimate national energy concerns, and thus a review of the State Implementation Plans is a logical follow-up to EPA's initial appraisal (1972) of the SIPs. At that time SIPs were approved by EPA if they demonstrated the attainment of the original NAAQS or the more stringent State air quality standards. Also, at that time an acceptable method for formulating control strategies was the use of an example region for demonstrating the attainment of the standards.

The example region concept permitted a State to identify the most polluted air quality control region (AQCR) and adopt control regulations which would be adequate to attain the NAAQS in that region. In using an example region, it was assumed that NAAQS would be attained in the other AQCRs of the State if the control regulations were applied to similar sources. But use of an example region can result in excessive controls, especially in the utilization of clean fuels, for areas of the State where sources would not otherwise contribute to NAAQS violations. For example, a control strategy based on a particular region or source can result in a regulation requiring 1 percent sulfur oil to be burned statewide, even though the use of 3 percent sulfur coal would be adequate to attain NAAQS in some locations.

EPA anticipates that a number of States will use the review findings to assist them in deciding whether or not to revise portions of their State implementation plans. However, it is most important for such States to recognize the limitations of the present review. The findings of this report are by no means conclusive and are neither intended nor adequate to be the sole basis for SIP revisions; they do, however, represent

EPA's best judgement and effort in complying with the ESECA requirements. The time and resources which EPA has had to prepare the reports has not permitted the consideration of growth, economics, and control strategy tradeoffs. Also, there has been only limited dispersion modeling data available by which to address individual point source emissions. Where the modeling data for specific sources was found, however, it was used in the analysis.

The data upon which the reports' findings are based is the most currently available to the Federal Government. However, EPA believes that the States possess the best information for developing revised plans. The States have the most up-to-date air quality and emissions data, a better feel for growth, and the fullest understanding for the complex problems facing them in the attainment and maintenance of air quality standards. Therefore, those States desiring to revise a plan are encouraged to verify and, in many instances, expand the modeling and monitoring data used to support EPA's findings. States are encouraged to consider the overall impact which the potential relaxation of overly restrictive emissions regulations for combustion sources might have on their future control programs. This may include air quality maintenance, prevention of significant deterioration, increased TSP, $NO_x$, and HC emissions which occur in fuel switching, and other potential air pollution situations.

At present, the Division of Air Pollution for the Commonwealth of Kentucky, with assistance from EPA, is developing a proposed plan revision which, if adopted, would be consistent with the intent of the Clean Fuels Policy and ESECA. This proposal is expected to detail areas where definite clean fuel savir_s are possible, but it may point out areas where more restrictive emission limits will be necessary to provide for continuous attainment and maintenance of the NAAQS. At the same time, the Division of Air Pollution Control will recommend that the State's ambient air quality standards be modified to make them more consistent with the present NAAQS.

Although the enclosed analysis has attempted to address the attainment of all the NAAQS, most of the review has focused on total suspended particulate matter (TSP) and sulfur dioxide ($SO_2$) emissions. This is because stationary fuel combustion sources constitute the greatest source of $SO_2$ emissions and are a major source of TSP emissions.

The following are the principle findings for the State of Kentucky (Air Quality Control Regions are displayed on Figure 1).

--The State had adopted ambient standards which are equivalent to the original Federal National Ambient Air Quality Standards. Two of these standards are no longer in effect at the Federal level but still

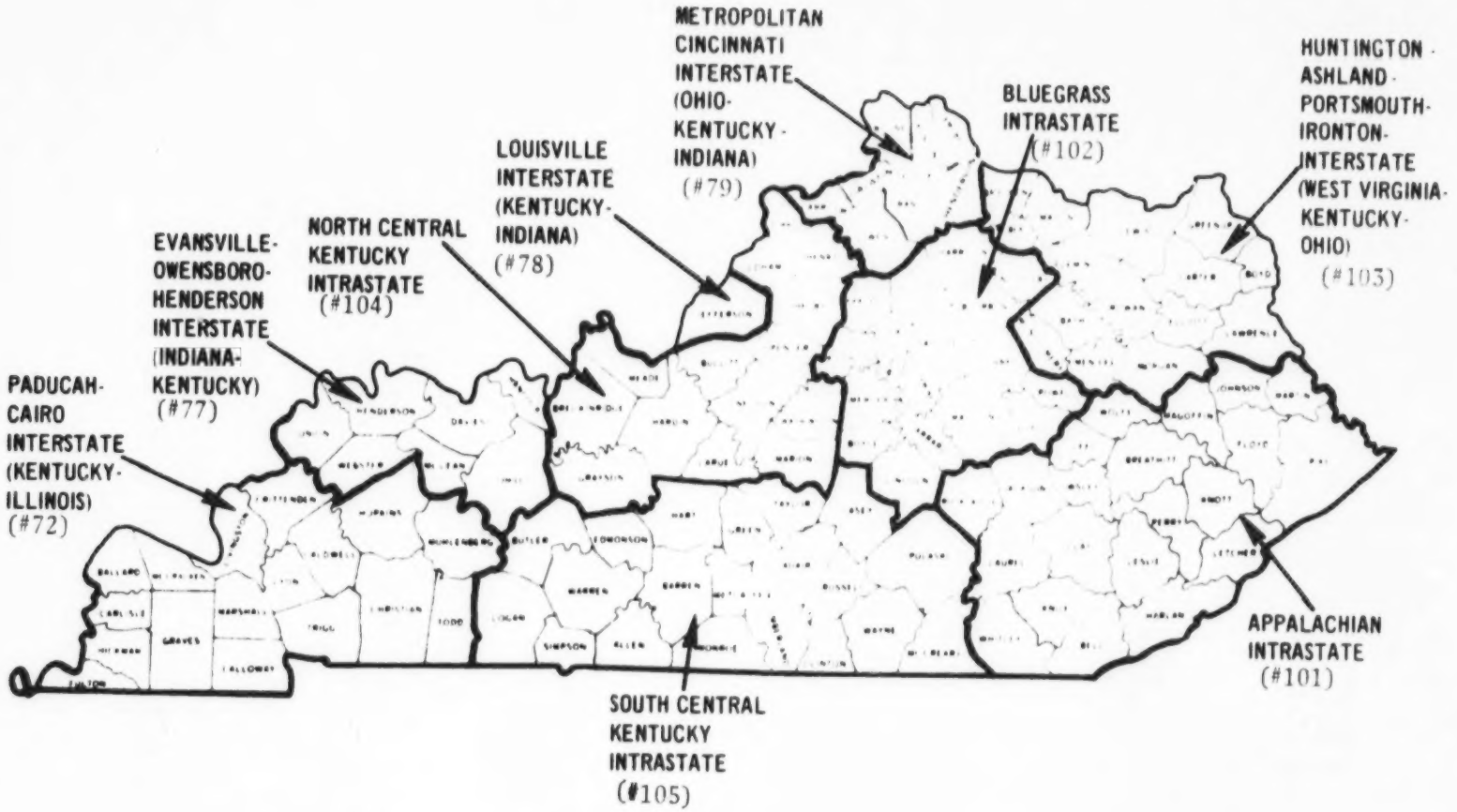
METROPOLITAN CINCINNATI INTERSTATE (OHIO-KENTUCKY-INDIANA) (#79)
BLUEGRASS INTRASTATE (#102)
HUNTINGTON-ASHLAND-PORTSMOUTH-IRONTON-INTERSTATE (WEST VIRGINIA-KENTUCKY-OHIO) (#103)
LOUISVILLE INTERSTATE (KENTUCKY-INDIANA) (#78)
NORTH CENTRAL KENTUCKY INTRASTATE (#104)
EVANSVILLE-OWENSBORO-HENDERSON INTERSTATE (INDIANA-KENTUCKY) (#77)
PADUCAH-CAIRO INTERSTATE (KENTUCKY-ILLINOIS) (#72)
APPALACHIAN INTRASTATE (#101)
SOUTH CENTRAL KENTUCKY INTRASTATE (#105)

Figure 1-1. Kentucky Air Ouality Control Regions (AQCR)

exist as State standards. Attainment of these State standards would require stricter emission controls than would attainment of the present Federal NAAQS only. The Kentucky Division of Air Pollution Control will, in the near future, recommend the revising of the State ambient standards to be consistent with Federal NAAQS.

--The State's $SO_2$ regulations were developed using the example region approach, and emission limits which vary with a region's priority classification were adopted. These limits are to be met by July 1, 1977, in Priority I regions; July 1, 1978, in Priority II regions; and July 1, 1979, in Priority III regions. At present, the proposed revision being developed by the Kentucky Division of Air Pollution would require emission limitations to be based upon specific area or source constraints rather than on regional considerations.

--Within the framework of this limited review, there appears to be little possibility for particulate regulation relaxation. High particulate levels are being measured throughout most of the State.

--The Louisville (78) AQCR seems a poor candidate for $SO_2$ regulation revision due to problems with NAAQS attainment and maintenance and little clean fuel savings potential based on modeling results in the original State plan. For two regions, South Central Kentucky (105) and Appalachian (101), modeling results indicate that more restrictive $SO_2$ emission limits may be necessary in certain counties to provide attainment and maintenance of the NAAQS. Two other regions, Paducah-Cairo (72) and Bluegrass (102), have counties where $SO_2$ regulations may be relaxed and at the same time other counties where $SO_2$ regulations may need to be tightened, according to modeling results. Modeling indicates that in the Evansville-Owensboro AQCR (77), $SO_2$ regulations may be relaxed; however, care must be taken not to disrupt the air quality maintenance planning in the Indiana portion of the AQCR. The Cincinnati (79) and Huntington-Ashland (103) AQCRs yielded modeling results which indicate possible regulation revision and clean fuel savings. Finally, the North Central Kentucky AQCR (104) has no significant potential clean fuel savings because of low regional fuel requirements.

--Of 18 power plants scheduled to be on-line in 1975, all are primarily coal-fired. Almost all of the large industrial point sources are coal-fired also. Therefore, the major impact of any regulation change would be in the increased utilization of high sulfur coal.

## 2.0 Kentucky State Implementation Plan Review

### 2.1 Summary

A revision of fuel combustion source emissions regulations will depend on many factors. For example:

1. Does the State now have air quality standards which are more stringent than the NAAQS?
2. Does the State have emission limiting regulations for the control of (1) power plants, (2) industrial sources, (3) area sources?
3. Did the State use an example region approach in demonstrating the attainment of NAAQS or possibly more stringent State standards?
4. Has the State initiated action to modify combustion source emission regulations for fuel savings;i.e., under the Clean Fuels Policy?
5. What is the approved attainment date for the NAAQS?
6. Are there any proposed Air Quality Maintenance Areas?
7. Are there reported violations of NAAQS?
8. Does available air quality data indicate a tolerance for increasing emissions?
9. Are the total emissions from stationary fuel combustion sources proportionally higher than those of other sources?
10. Do modeling results for specific fuel combustion sources in a region show a potential for a regulation (1) relaxation, (2) tightening, (3) both, or (4) no change?
11. Is there a significant clean fuels saving potential in the region if regulations were revised?

The following table of this report is intended to answer the preceding questions for each region. In the case of interstate AQCRs, answers pertain to the Kentucky portion of the region only unless specifically noted differently.

TABLE 1

STATE IMPLEMENTATION PLAN REVIEW SUMMARY FOR KENTUCKY

| Indicator \ Region | State | Paducah-Cairo[a] AQCR 72 | | Evansville-Owensboro[a] AQCR 77 | | Louisville[a] AQCR 78 | | Cincinnati[a] AQCR 79 | |
|---|---|---|---|---|---|---|---|---|---|
| | | TSP | $SO_2$ | TSP | $SO_2$ | TSP | $SO_2$ | TSP | $SO_2$ |
| Does the State now have air quality standards which are more stringent than the NAAQS? | Yes | | | | | | | | |
| Does the State have emission limiting regulations for the control of (1) power plants, (2) industrial sources, (3) area sources? | (1) Yes<br>(2) Yes<br>(3) Yes | | | | | | | | |
| Did the State use an example region approach in demonstrating the attainment of NAAQS or possibly more stringent State standards? | Yes | | Example Region Priority II | | | Example Region Priority I | | | |
| Has the State initiated action to modify combustion source emission regulations for fuel savings; i.e., under the Clean Fuels Policy? | Yes | | | | | | | | |
| What is the approved attainment date for NAAQS? | | 75 | 78 | 75 | 78 | 75 | 77 | 75 | 78 |
| Are there any proposed Air Quality Maintenance Areas? | | No | No | Yes[b] | Yes[b] | Yes | Yes | Yes[c] | No |
| Are there reported violations of NAAQS? | | Yes | Yes[d] | Yes | No | Yes | Yes | Yes | No |
| Does the available air quality data indicate a tolerance for increasing emissions? | | No | No[e] | No | Yes | No | No | No | Yes |
| Are the total emissions from stationary fuel combustion sources proportionally higher than those of other sources? | | Yes | Yes | No | Yes | No | Yes | No | Yes |
| Do modeling results for specific fuel combustion sources in a region show a potential for a regulation (1) relaxation, (2) tightening, or (3) both (1) & (2) or (4) no change? | | N/A | (3) | N/A | (1) | N/A | (4) | N/A | (1) |
| Is there a significant clean fuels saving potential in the region if regulations were revised? | | Yes | | Yes | | No | | Yes | |

TABLE 1 (Cont.)

| Indicator \ Region | Applachian AQCR 101 | | Bluegrass AQCR 102 | | Huntington-Ashlanda AQCR 103 | | North Central Kentucky AQCR 104 | | South Central Kentucky AQCR 105 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | TSP | $SO_2$ | TSP | $SO_2$ | TSP | $SO_2$ | TSP | $SO_2$ | TSP | $SO_2$ |
| Does the State now have air quality standards which are more stringent than the NAAQS? | | | | | | | | | | |
| Does the State have emission limiting regulations for the control of (1) power plants, (2) industrial sources, (3) area sources? | | | | | | | | | | |
| Did the State use an example region approach in demonstrating the attainment of NAAQS or possibly more stringent State standards? | Example Region Priority II | | | | | | | | | |
| Has the State initiated action to modify combustion source emission regulations for fuel savings, i.e., under the Clean Fuels Policy? | | | | | | | | | | |
| What is the approved attainment date for NAAQS? | 75 | 79 | 75 | 79 | 75 | 79 | 75 | 79 | 75 | 79 |
| Are there any proposed Air Quality Maintenance Areas? | No | No | No | No | No | No | No | No | No | No |
| Are there reported violations of NAAQS? | Yes | No | Yes | No | Yes | No | Yes | No | Yes | No |
| Does the available air quality data indicate a tolerance for increasing emissions? | No | Yes | No | Yes | No | Yes | No | Yes | No | Yes |
| Are the total emissions from stationary fuel combustion sources proportionally higher than those of other sources? | No | Yes | Yes | Yes | No | Yes | No | Yes | Yes | Yes |
| Do modeling results for specific fuel combustion sources in a region show a potential for regulation (1) relaxation, (2) tightening, or (3) both (1) & (2) or (4) no change? | N/A | (2) | N/A | (3) | N/A | (1) | N/A | (4) | N/A | (2) |
| Is there a significant clean fuels saving potential in the region if regulations were revised? | No | | Yes | | Yes | | No | | No | |

a - Interstate AQCR.
b - There are proposed AQMAs in Indian portion of the region.
c - There are proposed AQMAs in Ohio portion of the region.
d - Violations recorded in Illinois portion of the region, believed to be attributed to Kentucky sources.
e - Modeling shows tolerance in portion of region.

## 2.2 Air Quality Setting for the State of Kentucky

### 2.2.1 Kentucky Air Pollution Control Areas

The State of Kentucky is divided into nine Air Quality Control Regions (AQCRs) as shown in Figure 1: four intrastate and five interstate. Table 2 gives the pollutant priority classifications for each of these regions. The table also shows population to be highest in Metropolitan Cincinnati (AQCR #79) and Louisville (AQCR #78). Based on growth projections for the State, one county has been proposed as an Air Quality Maintenance Area (AQMA) for sulfur dioxide and particulates. This is indicated in Table 2.

### 2.2.2 Kentucky Ambient Air Quality Standards

As shown in Table 3, Kentucky has adopted Federal primary and secondary National Ambient Air Quality Standards (NAAQS) for particulates, sulfur oxides, and nitrogen dioxide. The secondary annual $SO_2$ Standard adopted in Kentucky was the same as the original Federal standard which has since been rescinded. In addition, the secondary annual standard for particulates has been redefined as a "guide" for use in assessing implementation plans to achieve the 24-hour standard. The Kentucky Division of Air Pollution plans to recommend that the State standards be revised so as to be consistent with the present Federal NAAQS. Until this is done, the State ambient standards may require degrees of control in excess of those required by the NAAQS. These standards are shown in Table 3.

### 2.2.3 Kentucky Air Quality Status

The number of air quality monitoring stations for $SO_2$ and total suspended particulates, along with the number of stations reporting violations in 1973 are summarized by region in Table 4. Particulate violations have been recorded at more than one station in every region, showing little possibility of a regulation relaxation.

$SO_2$ violations of the ambient standards have only been recorded at sampling stations in the Louisville (#78) AQCR for stations operating in the Commonwealth of Kentucky in 1973. Since all other regions show no violations, it would appear there is a tolerance for $SO_2$ regulation revision. However, since not every area of every region can be adequately monitored, atmospheric diffusion modeling must be considered along with reported air quality data in order to determine the actual counties suitable for potential regulation revisions.

TABLE 2. Kentucky Air Pollution Control Areas

| Air Quality Control Region | Priority Classification: Federal Number | Priority Classification: Particulates | Priority Classification: $SO_x$ | Demographic Information: Population 1970 (Millions) | Demographic Information: Area (square miles) | Demographic Information: Population per square mile | AQMA Proposed Designations: TSP Counties | AQMA Proposed Designations: $SO_x$ Counties |
|---|---|---|---|---|---|---|---|---|
| 1. Paducah-Cairo (Ill.) Kentucky Portion | 72 | I | II | 0.40<br>0.34 | 8012<br>6478 | 50<br>52 | (0) | (0) |
| 2. Evansville-Owensboro-Henderson (Ind.) Kentucky Portion | 77 | I | II | 0.50<br>0.18 | 5704<br>2688 | 88<br>67 | (2) Vanderburg, Ind.<br>Warrick, Ind. | (2) Vanderburg, Ind.<br>Warrick, Ind. |
| 3. Louisville (Ind.) Kentucky Portion | 78 | I | I | 0.82<br>0.69 | 908<br>387 | 903<br>1783 | (3) Jefferson, Ky<br>Clark, Ind.<br>Floyd, Ind. | (1) Jefferson, Ky |
| 4. Metropolitan Cincinnati (Ohio, Ind.) Kentucky Portion | 79 | I | II | 1.66<br>0.29 | 3316<br>1708 | 435<br>170 | (3) Dearborn, Ind.<br>Hamilton, Ohio<br>Clermont, Ohio | (1) Dearborn, Ind. |
| 5. Appalachian | 101 | II | III | 0.50 | 7791 | 64 | (0) | (0) |
| 6. Bluegrass | 102 | II | III | 0.45 | 4316 | 104 | (0) | (0) |
| 7. Huntington-Ashland-Portsmouth-Ironton (W.Va., Ohio) Kentucky Portion | 103 | I | III | 0.59<br>0.22 | 8148<br>4348 | 72<br>51 | (0) | (0) |
| 8. North Central Kentucky | 104 | II | III | 0.25 | 4313 | 52 | (0) | (0) |
| 9. South Central Kentucky | 105 | III | III | 0.32 | 7571 | 42 | (0) | (0) |

TABLE 3

AMBIENT AIR QUALITY STANDARDS

| | State ($ug/m^3$) | Federal ($ug/m^3$) |
|---|---|---|
| Total Suspended Particulate | | |
| Primary | | |
| Annual | 75(G) | 75(G) |
| 24-Hour[a] | 260 | 260 |
| Secondary | | |
| Annual | 60(G) | 60(G)[c] |
| 24-Hour[a] | 150 | 150 |
| Sulfur Oxides | | |
| Primary | | |
| Annual | 80(A) | 80(A) |
| 24-Hour[a] | 365 | 365 |
| Secondary | | |
| Annual | 60(A)[b] | --- |
| 3-Hour[a] | 1300 | 1300 |

[a]Not to be exceeded more than once per year.
(A) Arithmetic mean
(G) Geometric mean

[b]This standard, which was adopted based upon the original (April 30, 1971) NAAQS, was rescinded by EPA in July 1973.

[c]Guide to be used in assessing implementation plans to achieve the 24-hour standard.

TABLE 4

KENTUCKY AQCR AIR QUALITY STATUS (1973)
TOTAL SUSPENDED PARTICULATES

| AQCR | NUMBER OF STATIONS REPORTING | NUMBER OF STATIONS SHOWING VIOLATION | | | |
|---|---|---|---|---|---|
| | | ANNUAL STANDARD | | 24-HOUR STANDARD | |
| | | PRIMARY | SECONDARY | PRIMARY | SECONDARY |
| 72 | 25 | 11 | 19 | 0 | 7 |
| 77 | 19 | 10 | 15 | 1 | 9 |
| 78 | 23 | 12 | 17 | 2 | 9 |
| 79 | 22 | 5 | 15 | 0 | 3 |
| 101 | 5 | 3 | 4 | 0 | 1 |
| 102 | 12 | 1 | 4 | 0 | 0 |
| 103 | 14 | 7 | 9 | 0 | 4 |
| 104 | 7 | 0 | 2 | 0 | 0 |
| 105 | 9 | 1 | 3 | 0 | 0 |

KENTUCKY AQCR AIR QUALITY STATUS (1973)
SULFUR DIOXIDE

| AQCR | NUMBER OF STATIONS REPORTING | NUMBER OF STATIONS SHOWING VIOLATION | | |
|---|---|---|---|---|
| | | ANNUAL STD (PRIMARY) | 24-HOUR (PRIMARY) | 3-HOUR (SECONDARY) |
| 72 | 24 | 0 | 0 | 0 |
| 77 | 18 | 0 | 0 | 0 |
| 78 | 29 | 2 | 0 | 0 |
| 79 | 16 | 0 | 0 | 0 |
| 101 | 4 | 0 | 0 | 0 |
| 102 | 10 | 0 | 0 | 0 |
| 103 | 15 | 0 | 0 | 0 |
| 104 | 7 | 0 | 0 | 0 |
| 105 | 6 | 0 | 0 | 0 |

### 2.2.4 Kentucky Emission Summary

Emission summaries showing the percent contribution from major source categories for each region are shown in Table 5. This data was taken from the original Kentucky State Implementation Plan which reflects the 1970 emission inventory. Fuel combustion sources are the major contributor of particulate emissions only in the Louisville (#78) AQCR while in every region but the Appalachian (#101) AQCR, these sources are the major contributor for sulfur oxides.

### 2.2.5 Power Plant Modeling

Detailed atmospheric diffusion modeling is presently being performed by the Kentucky Division of Air Pollution and the Region IV Atlanta Office of EPA for major $SO_2$ sources in Kentucky as required to implement a plan revision. At the time of this report, the data is still under evaluation. However, tentative projections can be made with regard to the impact of a regulation revision on power generation fuel usage. Table 6 compares, for each air quality control region, the power plant fuel consumption and sulfur content (based upon 1973 data) required for complying with existing regulations versus fuel required under a regulation modification designed to eliminate overkill. This table shows a significant clean fuels savings in the 1 to 2% and 2 to 3% sulfur range for the entire State. The possibility exists for the consumption of over 16 million tons of coal with sulfur content of 3% without violating the primary NAAQS. Under existing regulations this coal could not be consumed.

This table is a tentative projection, but upon completion of this modeling task, precise clean fuel savings potential will be evident and the extent of a possible $SO_2$ regulation revision assessed.

TABLE 5

KENTUCKY EMISSION SUMMARY[a]

REGIONAL RELATIVE CONTRIBUTION OF SOURCE CATEGORIES

| Source Category | Region | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 72 | 77 | 78 | 79 | 101 | 102 | 103 | 104 | 105 |
| **Particulates** | | | | | | | | | |
| Fuel Combustion | 13.4 | 14.8 | 73.8 | 1.2 | 2.0 | 19.9 | 10.2 | 4.1 | 10.1 |
| Process Losses | 80.6 | 81.5 | 10.7 | 95.9 | 74.2 | 76.9 | 86.6 | 93.2 | 88.0 |
| Solid Waste | 1.4 | 1.0 | 11.5 | 1.6 | 2.6 | 2.3 | 1.3 | 1.3 | 1.1 |
| Transportation | 1.2 | 1.7 | 4.0 | 1.3 | 0.6 | 0.8 | 0.9 | 1.1 | 0.5 |
| Misc. Area Sources | 3.4 | 0.9 | --- | --- | 20.6 | 0.1 | 1.0 | 0.3 | 0.3 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |
| **Sulfur Oxides** | | | | | | | | | |
| Fuel Combustion | 98.2 | 97.6 | 98.3 | 62.4 | 10.3 | 96.7 | 94.0 | 93.8 | 97.1 |
| Process Losses | 3.4 | 0.2 | 0.7 | --- | --- | --- | 4.2 | --- | --- |
| Solid Waste | --- | 0.1 | 0.4 | 5.3 | 0.4 | 0.7 | 0.2 | 0.8 | 0.4 |
| Transportation | 0.2 | 1.0 | 0.6 | 32.3 | 2.3 | 2.6 | 1.6 | 5.4 | 1.8 |
| Misc. Area Sources | 1.2 | 1.1 | --- | --- | 87.0 | 0 | --- | --- | 0.7 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

[a]Data Taken From Original Kentucky State Implementation Plan.

TABLE 6

KENTUCKY POWER PLANT EVALUATION SUMMARY

| AQCR | Fuel | Fuel Sulfur Content Required By Existing Regulations[a] (Coal - 1000 tons/yr.) (Oil - 1000 gal./yr.) < 1% S | 1-2% S | 2-3% S | 3% S | Fuel Sulfur Content Required By Modified Regulations[b] (Coal - 1000 tons/yr.) (Oil - 1000 gal./yr.) < 1% S | 1-2% S | 2-3% S | 3% S |
|---|---|---|---|---|---|---|---|---|---|
| 72 | Coal | | 11,764 | | | 4,282 | | | 7,482 |
| | Oil | | | | | | | | |
| 77 | Coal | | 3,544 | | | | | | 3,544 |
| | Oil | | | | | | | | |
| 78 | Coal | 3,799 | | | | 3,799 | | | |
| | Oil | | | | | | | | |
| 79 | Coal | 3,200 | 1,450 | | | 3,200 | | | 1,450 |
| | Oil | | | | | | | | |
| 101 | Coal | | | 35 | | 35 | | | |
| | Oil | | | | | | | | |
| 102 | Coal | | | 2,097 | | | 631 | | 1,466 |
| | Oil | | | 1,020 | | | 1,020 | | |
| 103 | Coal | | | 2,442 | | | | | 2,442 |
| | Oil | | | | | | | | |

[a]Fuel requirements based upon 1973 fuel use patterns from Federal Power Commission data (except for new facilities, not operating in 1973, where fuel tonnage was estimated from megawatt rating through 1978).

[b]Maximum allowable % S was estimated from modeling results by U.S. Environmental Protection Agency, Region IV Office.

TABLE 6 (cont.)

KENTUCKY POWER PLANT EVALUATION SUMMARY

| AQCR | Fuel | Fuel Sulfur Content Required By Existing Regulations[a] (Coal - 1000 tons/yr.) (Oil - 1000 gal./yr.) < 1% S | 1-2% S | 2-3% S | 3% S | Fuel Sulfur Content Required By Modified Regulations[b] (Coal - 1000 tons/yr.) (Oil - 1000 gal./yr.) < 1% S | 1-2% S | 2-3% S | 3% S |
|---|---|---|---|---|---|---|---|---|---|
| 104 | Coal<br>Oil | No Power Plants | | | | No Power Plants | | | |
| 105 | Coal<br>Oil | | 658 | | | 658 | | | |
| Kentucky Total | Coal<br>Oil | 6,999 | 17,416 | 4,574<br>1,020 | 0 | 11,974 | 631<br>1,020 | 0 | 16.384 |

[a]Fuel requirements based upon 1973 fuel use patterns from Federal Power Commission data (except for new facilities, not operating in 1973, where fuel tonnage was estimated from megawatt rating).

[b]Maximum allowable % S was estimated from modeling results by U.S. Environmental Protection Agency, Region IV Office.

## 2.3 Background on the Development of the Current State Implementation Plan

### 2.3.1 General Information

The Kentucky State Implementation Plan presents a control strategy for attainment of the NAAQS based upon the example region approach. Two example AQCRs were used in developing the strategy for particulate matter, the Louisville Interstate AQCR (#78)(Priority I) and the Appalachian AQCR (#101)(Priority II). Two example AQCRs were also chosen in developing the control strategy for sulfur oxides, the Louisville Interstate AQCR (#76) (Priority I) and the Paducah-Cairo Interstate AQCR (#72)(Priority II). In each of these control strategies, area sources were projected to include growth while growth of point sources would be controlled by the Kentucky permit system. Through this analysis, attainment and maintenance of the NAAQS were demonstrated for the entire State.

### 2.3.2 Particulate Control Strategy

The Louisville AQCR (#78) was chosen as the Priority I example region for particulate matter because it contained (1) the highest measured particulate concentrations in the State, and (2) a wide variety of source types. The particulate control strategy for the Priority II example region, the Appalachian AQCR (#101), demonstrated attainment for all Priority II regions through a rollback (proportional model) analysis. No control strategies were evaluated for the Priority III AQCRs, but adequate particulate matter emission limiting regulations were adopted by the State for these regions thereby assuring maintenance of the secondary standards.

### 2.3.3 Sulfur Oxide Control Strategy

The Louisville AQCR (#78) was chosen as the Priority I example region for sulfur oxides for the same reasons that it was chosen the example region for particulate matter. The control strategy demonstration for the Priority II example region for sulfur oxides (Paducah-Cairo Interstate Region #72) was not officially submitted as part of Kentucky's plan; however, rollback (proportional model) calculations received from the Kentucky Air Pollution Control Commission and verified by the EPA indicate that the national standards will be attained in this example region. No control strategies were presented for the Priority III regions, but adequate sulfur oxide emission limiting regulations were adopted by the State for these regions thereby assuring maintenance of the secondary standards.

### 2.3.4 Control Regulations Summary

Table 7 and Figures 2, 3, and 4 summarize the existing Kentucky fuel combustion emission limitations. Emission limits are applied to new and existing units on the basis of the heat input of the entire facility. Different limits for sulfur oxides apply for coal and oil on a pounds of $SO_2$ per million basis. The particulate limitation is the same regardless of the fuel consumed. The emission limits are immediately effective except for the regulation for the control of sulfur oxide emissions which defer dates for final compliance as follows: Priority I AQCRs - July 1, 1977, Priority II AQCRs - July 1, 1978, and Priority III AQCRs - July 1, 1979.

Table 7. Kentucky Fuel Combustion Emissions Regulations

| | | |
|---|---|---|
| $SO_2$ | New Facilities | Existing Facilities |
| | Liquid Fuel: Priority I Emission Limit: Figure 2 | Liquid Fuel: Priority Region Emission Limit: Figure 2 |
| | Solid Fuel: Priority I Emission Limit: Figure 3 | Solid Fuel: Priority Region Emission Limit: Figure 3 |
| | In addition: | |
| | Maximum emission limit for new or modified sources: 500 tons/day. | |
| | Maximum emissions from all sources (individually, 100 tons/yr or more) within a ten mile radius of a new or modified source: 750 tons/day. | |

| | | |
|---|---|---|
| Particulates | Opacity: Ringleman No. 1 in Priority I regions<br>Ringleman No. 2 in Priority II and III regions | |
| | New Facilities | Existing Facilities |
| | New Installation Emission Limit: Figure 4 | Priority Region Emission Limit: Figure 4 |

| | | |
|---|---|---|
| $NO_x$ | New Facilities (>250x$10^6$ Btu/hr) | Existing Facilities (>300x$10^6$ Btu/hr) |
| | Gaseous Fuel: 0.2 lbs/$10^6$ Btu | Gaseous Fuel: 0.3 lbs/$10^6$ Btu |
| | Liquid Fuel: 0.3 lbs/$10^6$ Btu | Liquid Fuel: 0.3 lbs/$10^6$ Btu |
| | Solid Fuel: 0.7 lbs/$10^6$ Btu | Solid Fuel: 0.7 lbs/$10^6$ Btu |

Figure 3.

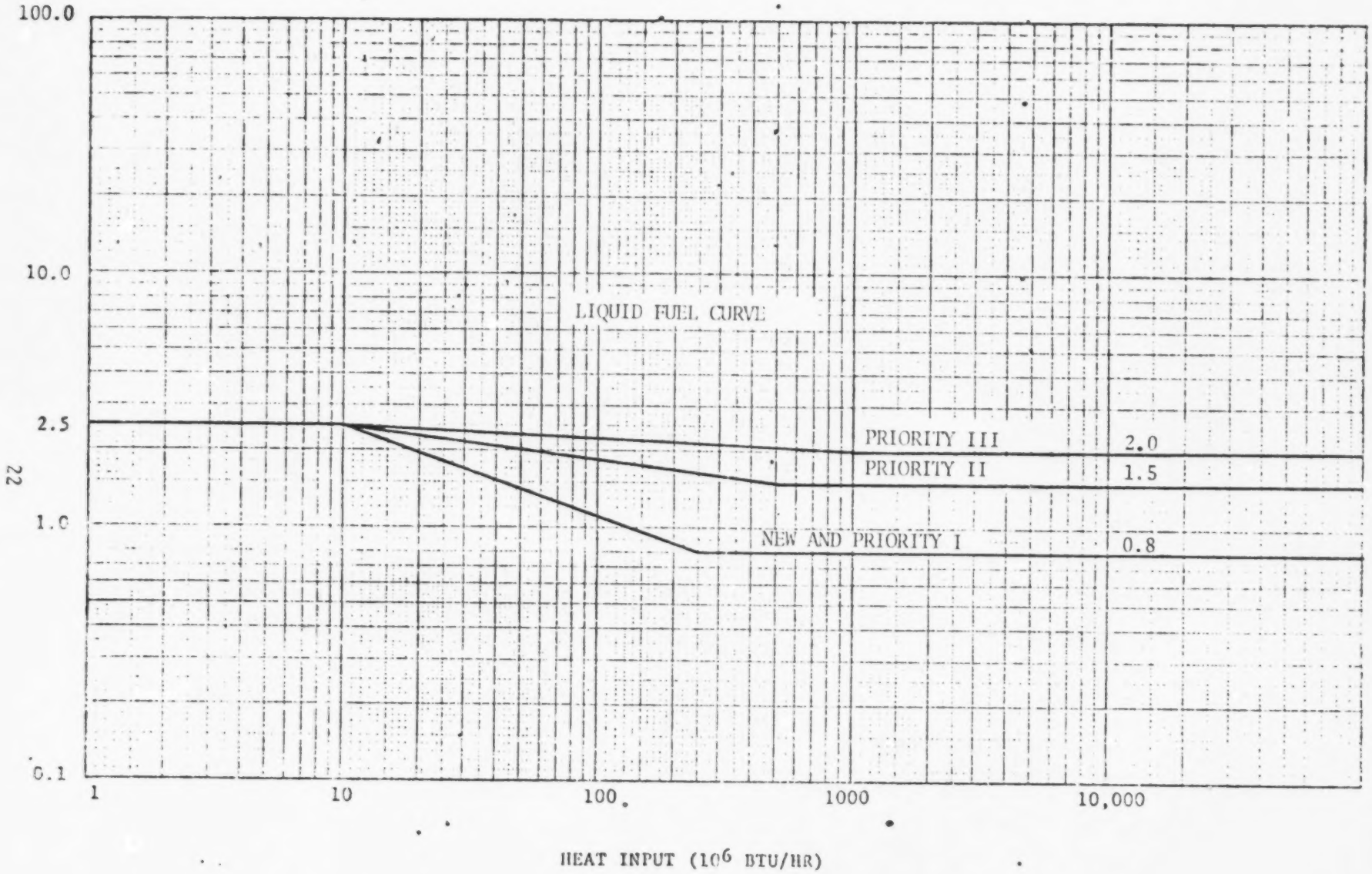


Figure 2. Kentucky Allowable Sulfur Dioxide Emissions Based on Heat Input Capacity

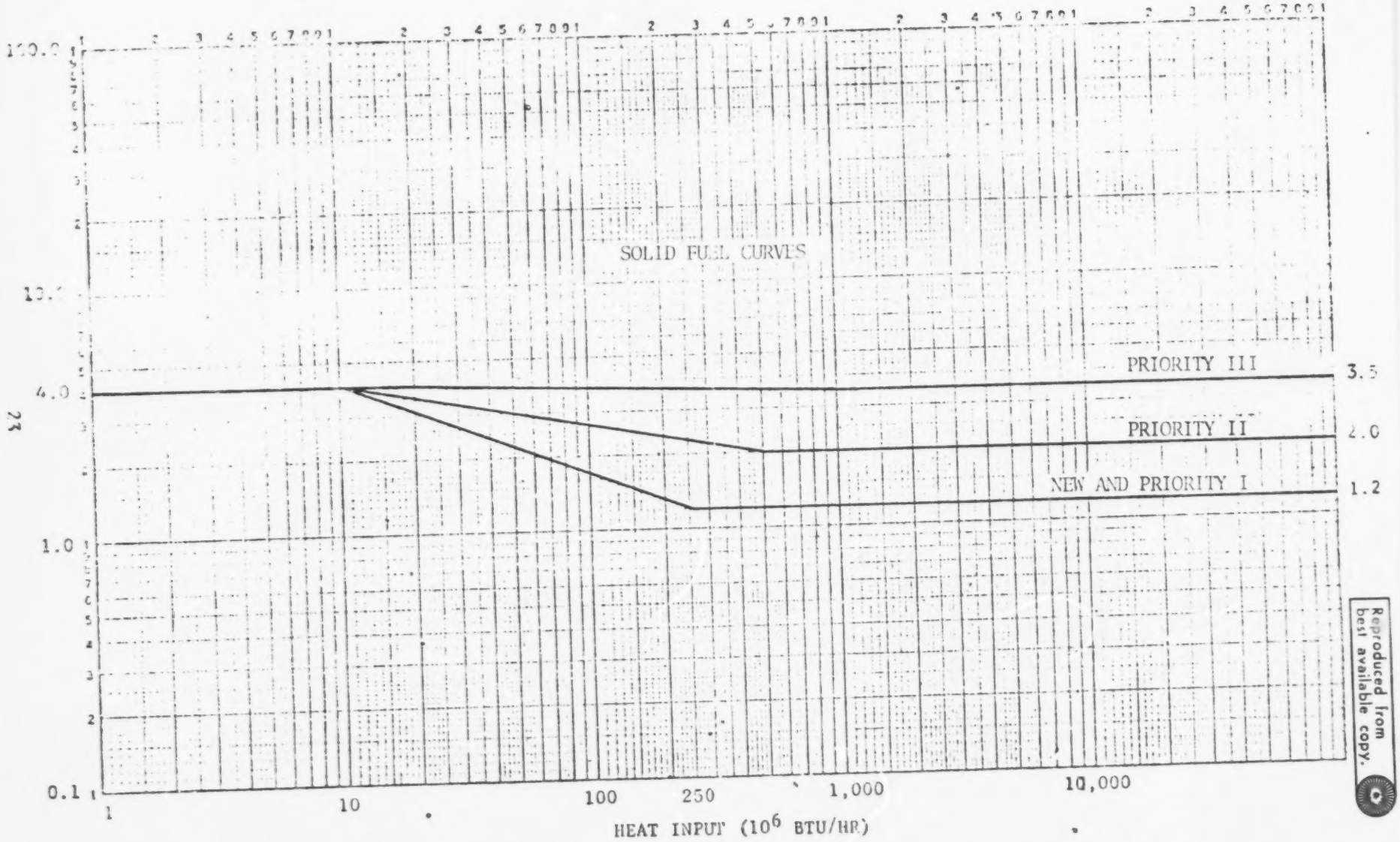


Figure 3. Kentucky Allowable Sulfur Dioxide Emissions Based on Heat Input Capacity

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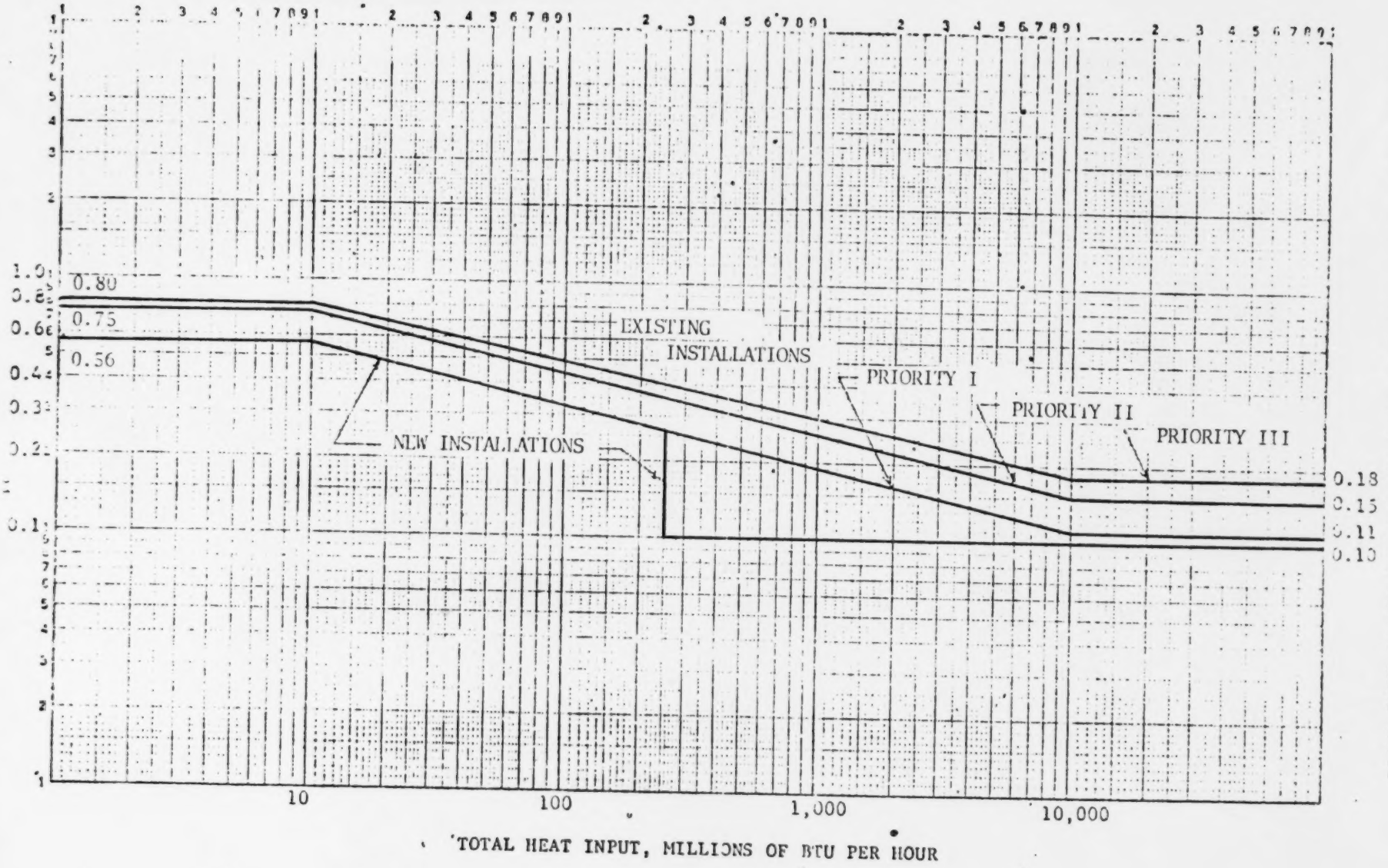


Figure 4. Kentucky Maximum Emission of Particulate Matter for Fuel Burning Installations

## 2.4 Special Considerations

### 2.4.1 Planned SIP Revisions

The proposed plan revision under development at this time by the Kentucky Division of Air Pollution with assistance from EPA will include detailed atmospheric diffusion modeling in the vicinities of major fuel combustion sources of sulfur oxides. The impact of a possible regulation change will be evaluated, and emission limits will be proposed based upon attainment and maintenance of the National Ambient Air Quality Standards without excessive overkill, while providing a reasonable margin of growth. Incorporated as part of this revision proposal will be a recommendation to revise the State ambient standards to be consistent with the NAAQS. Enactment of a revision of this nature will allow for significant clean fuel savings, while at the same time adhering to the requirements of the Clean Air Act.

### 2.4.2 Fuels

Kentucky is a heavy user and producer of bituminous coal. In 1972, Kentucky was the largest producer of coal, producing 20% of the bituminous coal mined in the United States. Kentucky power plants' heat input from coal alone accounted for 98% of the total heat input. The remaining 2% were the result of oil and gas utilization. Kentucky ranks fourth among the States in estimated bituminous coal reserves. The percentage of the reserves with various sulfur contents are:

(a) sulfur content, < 1% - 33%

(b) sulfur content, 1-2% - 8%

(c) sulfur content, > 2% - 59%

Despite the large supply of low sulfur coal (33% of the Kentucky total, most of which is in eastern Kentucky), full development of this resource is not expected in the short term (3-5 years). Most of the mines operating on these reserves are small and will not be able to meet the demand for low sulfur coal in the near future. Also, much of this coal is metallurgical grade and hence too expensive for use as fuel.

### 2.4.3 Potential Fuel Conversions

No power plants have been identified as having the capability to convert from oil to coal by the Federal Energy Administration since all Kentucky power plants are mainly coal burning facilities.